Battery Cooler

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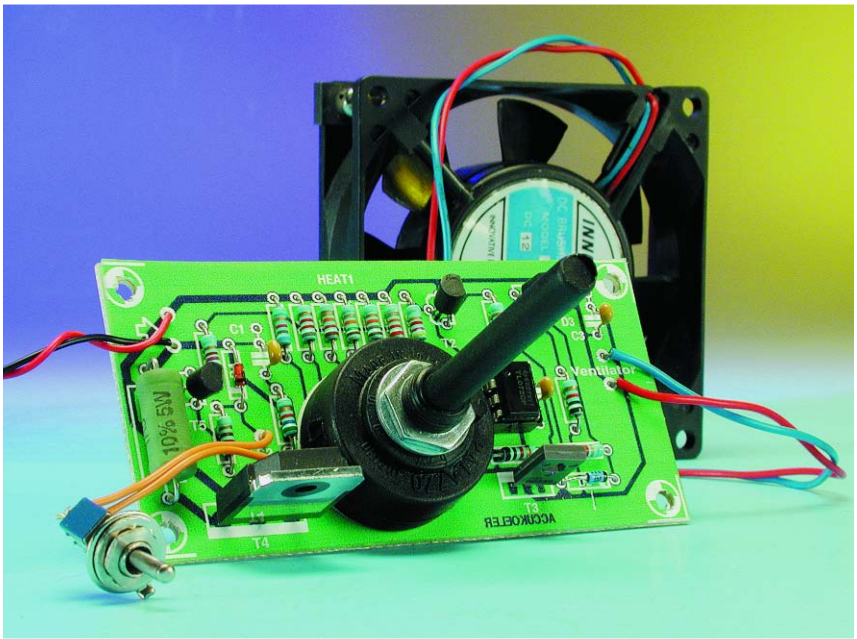


This battery cooler is used to cool and discharge lead-acid battery packs found in model planes, boats and cars, so that they can then be safely recharged.

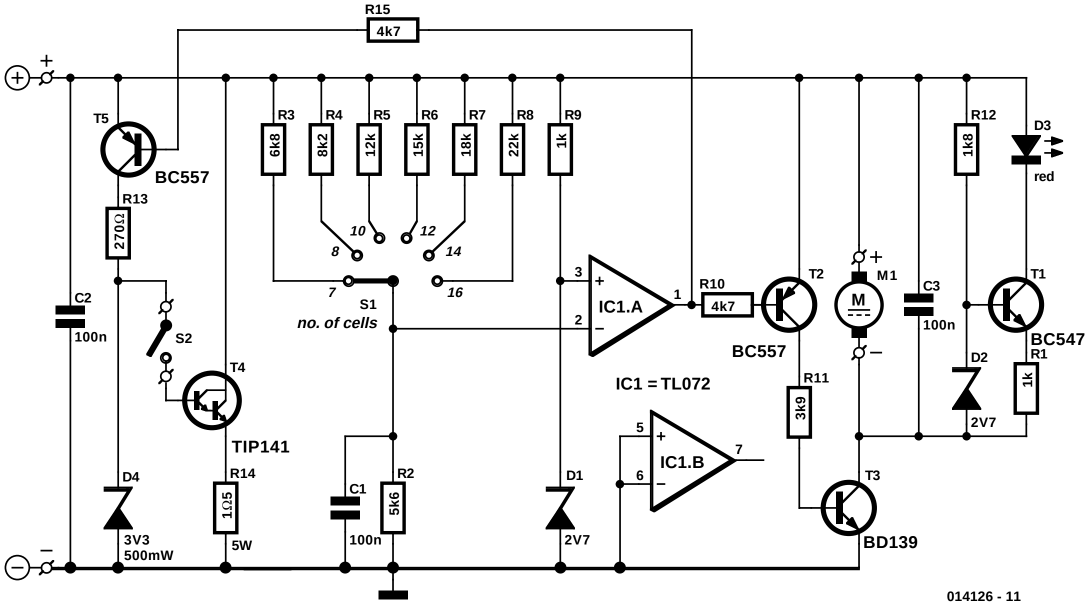
In electrically driven model planes, boats and cars the battery can become fairly warm during use. It is therefore unwise to recharge them directly after use. This circuit cools the battery using its residual charge after a (hopefully successful) landing. If the battery still contains too much charge, it can be safely removed by the integrated discharge circuit. Whilst the circuit is on (and the average cell voltage is greater than 0.8 V), LED D3 will be lit. This makes it possible to check the state of the battery from a distance.

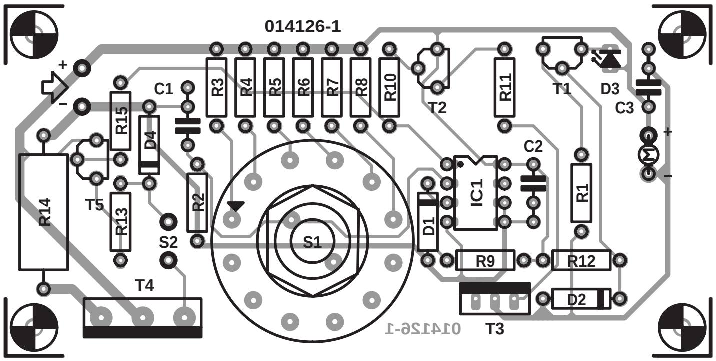
The design of the circuit is very simple. The battery which is to be cooled is connected to the '+' and '–' terminals. The battery also provides power to the circuit, which is very convenient. The supply voltage is fed to a potential divider and reduced by a factor selected with S1. This switch is used to specify how many cells the battery contains.

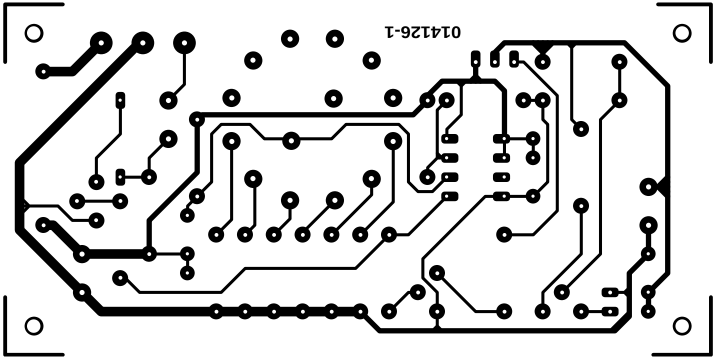
The voltage from the potential divider is compared with a fixed reference voltage of 2.7 V by opamp IC1A (wired as a comparator). When the voltage at the inverting input is greater than 2.7 V, transistors T2 and T5 will switch on.

Transistor T2 drives transistor T3, feeding the battery voltage to the fan (M1), which starts blowing. T3 also drives a constant current source, built round T1. This drives LED D3 and provides a visual indication that the battery is still discharging. D3 has been purposely driven by a constant current of about 2 mA, making the LED light up with the same brightness, independent of the number of cells (between 7 and 16!) or the state of the battery.

Transistor T5 is used to switch on the discharge circuit built round darlington T4. With switch S2 closed, a voltage of 3.3 V is fed to the base of T4. The voltage drop across the two base-emitter junctions will be 1.2 V. This leaves a voltage across R14 of 3.3–1.2 = 2.1 V. This causes a current of 1.4 A to flow through R14. Since 99.9% of this current comes from T4, this transistor will convert most of the







energy into heat. This does mean that T4 needs to be cooled well, with a heatsink rated at 3 K/W or better.

Constructing the circuit is a simple job when the PCB shown here is used. For an enclosure you could use a short length of PVC pipe, with the fan mounted at one of its ends. A wooden 'rail' could be fixed in the other end, on which to place the battery to be cooled.

(014126-1)

COMPONENTS LIST

Resistors:

R1 = 1kΩ
R2 = 5kΩ6
R3 = 6kΩ8
R4 = 8kΩ2
R5 = 12kΩ
R6 = 15kΩ
R7 = 18kΩ
R8 = 22kΩ
R9,R12 = 1kΩ8
R10,R15 = 4kΩ7
R11 = 3kΩ9
R13 = 270Ω
R14 = 1Ω5 5W

Capacitors:

C1,C2,C3 = 100nF

Semiconductors:

D1,D2 = zener diode 2V7 400mW
D3 = LED, red, high efficiency
D4 = zener diode 3V3 400mW
T1 = BC547
T2,T5 = BC557
T3 = BD139
T4 = TIP141/TIP142
IC1 = TL072

Miscellaneous:

S2 = on/off switch, 1 make contact
S1 = rotary switch, 2 poles, 6 positions
M1 = fan, 12V
Heatsink for T4: 3K/W, e.g., Fischer SK48 (Dau Components)
PCB, order code **014126-1**